CAM

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Exhaust

WAR is not good.

An undisputable fact that can't be argued.

Wars come . . . Wars go. When they come we fight them . . . and fight them to win. When they go, we go back to life as we knew it before. Or at least to the extent we can, under the somewhat changed conditions that result from War's complexities.

Complexities are the molds in which a hundred-thousand raw recruits are cast into a hundred-thousand fast-thinking globe-girdling specialists.

Many of these men, who entered the service not knowing a pitman arm from an axle shaft are soon the mechanics who can expertly handle the tools of maintenance that keep our armies on the move.

These complexities then, result in unavoidable good. From a thing that is not good comes many by-products that are.

Just one of these by-products is the vast throng of soldier vehicle operators who will return to civilian life as expert drivers. In the seats of Jeeps and the saddles of motorcycles, in the cabs of F.A.Ts and at the wheels of giant tank transporters, these men are getting an education.

An education in sensible and safety-first driving and the life or death importance of an efficiently operating Vehicle.

This cannot help but contribute to the nation's good when the Army's drivers again become civilian motorists. The highway accident toll provided a national problem of education and the War has provided a national training programme.

This then is the good thing. This is a complexity of War.

CAM

AUGUST – 1944
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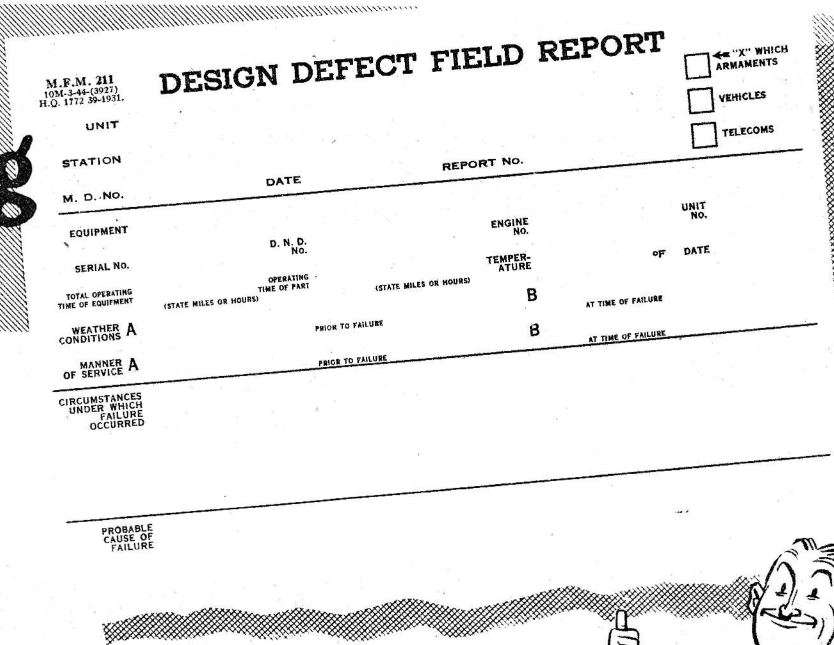
Are you Neglecting the . . .

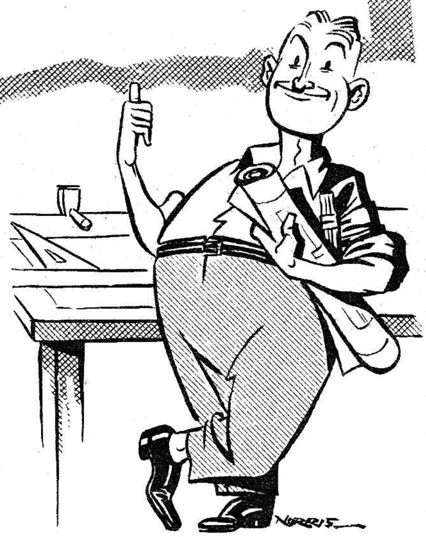


M.F.M. 211
10M-3-44-(3927)
H.Q. 1772 39-1931.

DESIGN DEFECT FIELD REPORT

"X" WHICH
ARMAMENTS
VEHICLES
TELECOMS

UNIT
STATION
M. D. No. DATE REPORT No.
EQUIPMENT ENGINE No. UNIT No.
SERIAL No. D. N. D. No. TEMPERATURE OF DATE
TOTAL OPERATING TIME OF EQUIPMENT (STATE MILES OR HOURS) OPERATING TIME OF PART (STATE MILES OR HOURS) B AT TIME OF FAILURE
WEATHER CONDITIONS A PRIOR TO FAILURE B AT TIME OF FAILURE
MANNER OF SERVICE A PRIOR TO FAILURE
CIRCUMSTANCES UNDER WHICH FAILURE OCCURRED
PROBABLE CAUSE OF FAILURE



ARE YOU THE STRONG SILENT TYPE? GIVE OUT BROTHER - YOU WON'T HURT ANYONE'S FEELINGS BY TELLING THE D. M. E. ABOUT A DEFECT IN YOUR VEHICLE. ONLY THE NIPS AND NASTIS WILL THANK YOU IF YOU DON'T.

"WHAT would you like for Christmas?" we politely enquired of Elmer, the man who handles the defects reports at N.D.H.Q.

Knocking us down with a handy feather, he replied "A nice big juicy bundle of Defect Reports".

Scrambling to our feet and recovering our composure and cigar stub from under a nearby desk, we took Elmer on our knee while he poured forth the whole sad story.

Design Defect Field Reports, it seems, are just about the most important things in Elmer's life—because he knows how important they are to the Army. And it's the lack of these Reports that has Elmer and his superiors in a condition of utter dejection.

Now everyone knows that the Canadian Army has the finest equipment it is possible to make, but still, we haven't reached the age of perfection. Therefore it's a logical assumption that there are certain defects in our paraphernalia.

"In fact", says Elmer, "I **know** there must be defects in our equipment—yet why doesn't somebody **tell** me about these things?"

"By 'somebody' ", we ventured to suggest, "you wouldn't be meanin' the boys in the field who are using, driving, maintaining, repairing, living and sleeping with it every day of their lives?"

"Who else?"

"Well, lets tell them what we want them to do", we suggested. "These boys know the score and when they find out how important the reporting of defects is—why, they'll kick in with their reports.

What makes us so sure? Well a lot of things. Y'see we know that when it comes to mechanical know-how, the average Canadian soldier takes a back bench to no one. Because of this fact, it's a safe bet to assume that you lads using this equipment have **discovered defects.**

Then why in hell haven't you reported them?

Several reasons. Maybe you don't think it's important enough—maybe you're not sure how to go about it—maybe you forgot about it—maybe you haven't been able to hit on a remedy.

O.K. Joe, let's get down to business by giving those reasons the old one-two and at the same time look over the good logical reasons why you should report these defects.

One thing to remember is that a Design Defect Field Report means just what it says—a form for the reporting of defects directly attributable to design. Parts that become defective through fair wear and tear don't come under this category—so you wouldn't rush in a report that the brake linings on your truck are showing signs of wear at 50,000 miles.

But suppose that during your daily checks you've noticed that a certain component on your vehicle

has persisted in working loose. You tighten it every few days but after a spell of cross-country driving it loosens up again. There are three things you might do. Ignore the whole thing and hope that when it does fall off you'll happen to be parked by the workshop door. Or, with the aid of your particular quota of ingenuity, improvise a fix and forget about it. Or—do what Elmer and every other driver will thank you for—grab up a Defect Report Form, fill in **all** the details and shoot them in. If you have an idea on a way of overcoming the trouble, all the better – but report the defect anyway.

If you're the kind of a guy we think you are you'll do the latter.

To help you do this the Army has provided MFM 211. In its latest version it can be used for reporting on Armaments, Vehicles, or Telecoms equipment—you may remember the old one just took care of Vehicles. The new form is a bit different again, in that you make four copies and shoot them all in to your District E.M.E.—(in the case of Commands and Camps to the DDME, ADME or Sr. E.M.E. as the case might be). He looks after them from there on and sees that they get to Elmer.

That ends your responsibility and starts the various brain trusts working. The Engineers at D.M.E. for instance will mill it over, test it, get all the angles figured and if necessary, go to the manufacturers and start the correction right on the production line. Eventually, all the workshops concerned will get the story via a CALEMEI (Canadian Army Local Electrical Mechanical Engineering Instruction)

See what's happened? Instead of just your vehicle having the troublesome defect corrected—every similar vehicle in the Army gets one more kink out of its system—and becomes that much better as a vehicle. The better our vehicles, guns and equipment are—the more efficiently we can operate against the enemy—the sooner we can win this war.

Before we take Elmer off our knee, there's just a couple of things we should tell you about him.

To start with, he's a pretty intelligent and well educated Joe. He reads without using his fingers and knows a rear end from a differential. But he ain't no mind reader! To make full use of a Defect Report he needs answers to **all** his questions. So tell the whole story—the new form helps in this regard by asking more questions than the previous one did.

Another thing—he likes pictures. He goes for that business about one picture being worth a thousand words. So—thoughtfully provided on the back of M.F.M. 211 is plenty of space to make sketches of the defective part. It's rulled off in squares to make the job of sketching easy.

Now you can relax, reach for a corona-corona and cogitate on the fact that if you should spot a bug in you equipment it's a mighty simple matter to swat it with a Defect Report.

Simple brother,—but important!

x y z

Jacking...

THERE comes a time in every man's life when he feels the need of jacking up a truck. Usually this means jacking up to take a wheel off. The jack is placed under the axle—the axle is plenty strong and nothing gets hurt.

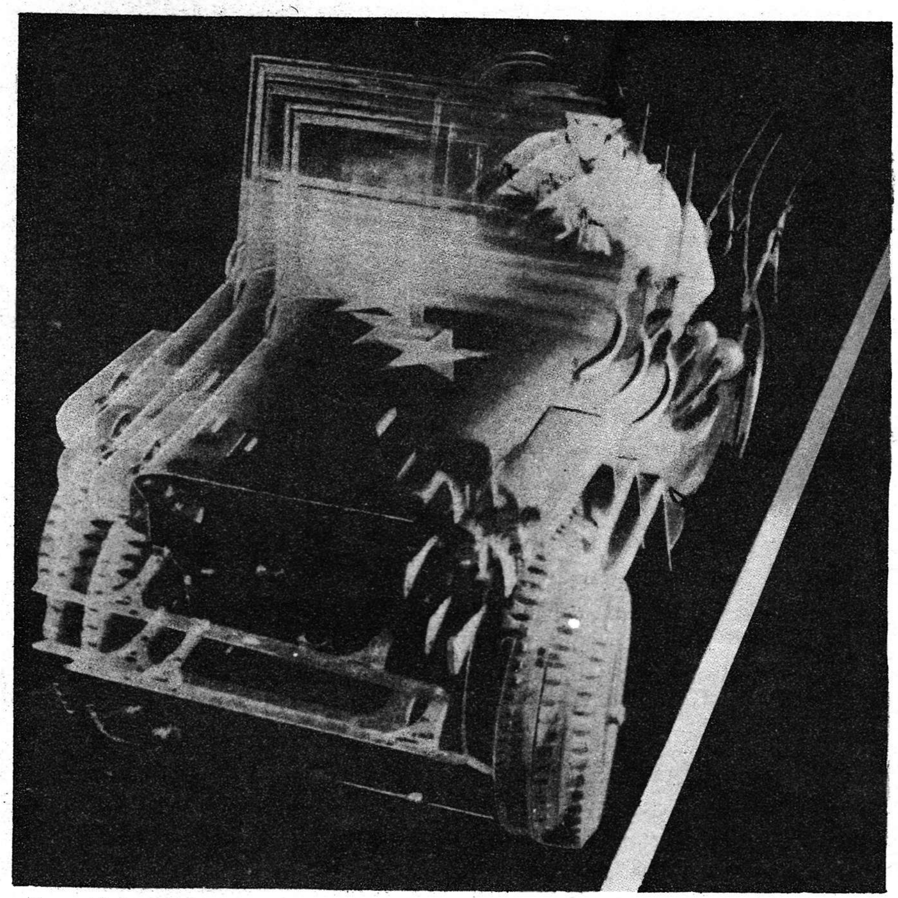
But s'pose there's a broken spring. It's necessary to take the weight off the springs and jacking up the axle won't work. Now Willie McGoon, a poisonal friend of ourn, would have taken the jack and stuck it anywhere under the frame without looking. Most likely he would hit some unsupported place on the frame. The frame being mostly channel sections, Willy would of started pumping the jack and the first thing you know the jack bends the bottom of the channel beam into the shape of V for victory.

Then the sarge would likely pick up a club with a nail in the end of it and wrap Willy lightly about the ears with it.

However—to prevent such goings on the thing to do is always be sure the jack is placed at some strong point of support—where there's cross members, at the bogie axle etc. You get the point.

How to stop a JEEP in a hurry

. . . without being whisked down a side road. That's what the pull to the left on the ¼-ton truck can do unless you know what to expect-and how to control it.



FROM ARMY MOTORS

A word about the photograph above

The clear sharp eye of the high-speed camera freezes the jeep in the act of pulling to the left. The test driver hugged the wheel hard to make the pull stronger. Notice how the front wheels have moved closer to the center stripe.

ORDINARILY, the Sad Sack's a pretty slow and droopy driver. One time he got in a spot. He had to stop fast or run over the captain. For a second there, the Sad Sack moved like a rocket. A foot flew out to the brake, mashed down the pedal, he hunched up and gripped the wheel hard, till finally the truck settled to a stop.

That's pretty much the way most of us make an emergency stop.

There are times though when stopping a ¼-ton jeep by that same system will give you a surprise. When you jam on the brake you'll feel the jeep dive to the left, like someone's underneath cutting the wheels on you. Nothing to get your intestines in an uproar about. It's just one of the facts of the jeep's driving life. The best thing a heads-up driver will do is stay cool, find out why it happens, and how he can control the pull to the left.

Here's the "how" part: just make your emergency stop the same with a jeep as you do on any other truck, except for one thing. Don't freeze the steering wheel. Let it have a little play. Still keep a firm grip, but hold your arms loose enough to give with the wheel a little, and to your right. Another thing, if you have time during the stop—pump the brake at least once. Don't give it one long push all the way down.

Those two things sound easy. Don't fool yourself, they take a good driver. You've got to remember them when youre in a tight spot—when it's the most natural thing in the world to kick out at the brake and hang on the wheel hard. You'll have to practice and keep the right way in mind. So in a pinch you'll automatically relax your grip and pump the pedal.

It's a case of knowing your jeep, too. Some have the curse more than others, and some conditions make the pull more noticeable. We found the pull strong when the stop was made on a smooth hard road. The worst pull . . . a pull that nearly swerved the jeep into the left lane . . . happened when the brakes were applied going around a left curve. That's not surprising though because putting on the brakes on a curve is

Joe Dope driver practice with any truck. Third gear—high or low range—brought out the attraction to the left more than any other gear. But the pull is liable to happen on any roads, any gears. The important thing is, it does happen. And the blame all goes to the jeep steering set-up.

It's a little different combination of rods and arms that takes your turn of the steering wheel down to the front wheels. Most trucks as you know have a steering system that looks like the grayed parts in Fig. 1. There's a one-piece tie rod connecting the steering knuckles. But the jeep has a bell crank on the front axle (black parts in Fig. 1), and a two-piece tie rod up front. It's different for a good reason: to leave more space between the underparts of the truck and the ground. The regular set-up with the one-piece rod would hang down too low if it were used on the ¼-ton jeep. You'd tear off a piece of the rod everytime you drove across a field.

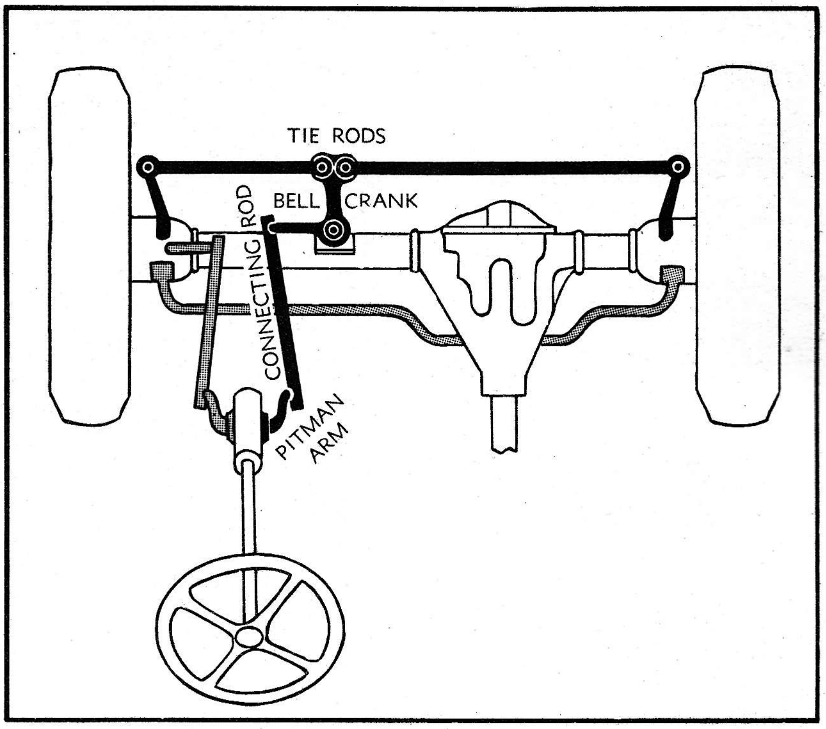


Fig. 1. Two steering systems on one drawing. Every truck has one or the other. Follow the gray lines—that's the conventional steering on most trucks. You can see how the jeep steering arrangement—in black—is different.

As the jeep rushes to a stop, something awful peculiar goes on with this steering. Wrap yourself around the front axle and watch. The brake shoes take hold, the tires grip. Just then you'll feel yourself twist forward a few degrees. The braking action makes the axle twist forward a little. You'll see the bell crank dip forward and down, because it's mounted right on the axle. Watch it—that's where the pulling business all starts. As the crank twists forward, the end in the steering connecting rod tries to pull the rod forward. If the rod stands pat, You'll see the crank pivot and swing the tie rod and wheels to the left (Fig. 2). Finally the jeep stops—over in the left lane somewhere.

You can see now why it's wrong to clench the steering wheel when the jeep's coming to a stop. Giving the wheel a little play to the right loosens up the steering system. Then the steering connecting rod is free to move forward with the bell crank instead of standing pat and holding back the end of the crank. The rod moves forward and the crank doesn't pivot and the jeep rolls to a straight stop.

The Army didn't hang the responsibility for the job of controlling the pull entirely on the driver's head. About a year ago the engineers popped up with a two-leaf spring arrengement to add on the left front spring. This Torque Reaction Spring was put on in production, and put on in the field (Modification B Veh. H-1) (Fig. 3). It did cut down the axle roll and make the pull much less violent. But because it's still noticeable, some of the mechanical geniuses have been swamping us with magic fixes to make the pull vanish completely. One fellow told us it

Fig. 2. Unless the steering wheel is allowed some play when you come to a hot stop, the bell crank goes into action—like we've shown in gray—and pivots the wheels to the left.

was just a simple matter of reversing the brake shoes on the left front wheel. Another GI stopped dreaming of Mabel a few nights to dream up a way to take some of the pep out of the left front wheel cylinder. Then the cylinder would have a softer push on that side, and the jeep would stop in a straight line. We'll admit those things do make the pull less noticeable. But man, that's reducing the braking power of the jeep! In an emergency stop, you'll need more space to stop in. Any cure that futzes with the brakes is worse than the disease of a left-pull

Not all the suggestions were off the ball. A few wanted to go back to the regular truck steering with the single tie rod, take the bell crank off the axle and stick it some place on the frame. No question that would cure the pull to the left. The Army's engineers know it, manufacturer's engineers know it and even O'Sweat knows this would do the trick. But there are two good and practical reasons why the step isn't being taken officially. First, any change would hang more iron under the jeep. There's not too much space now between the ground and underpinnings. Under rough combat conditions every inch is needed. Second, any modification in the steering made now would be tremendously costly. Costly in materials—hundreds of thousands of tons of metal would be needed to modify the jeeps that are dancing around in England, France, Russia, China, Africa, Italy, Australia, and the Pacific Islands. Costly in millions of man-hours to manufacture the parts. Costly in mechanic-hours in the field putting on the fix.

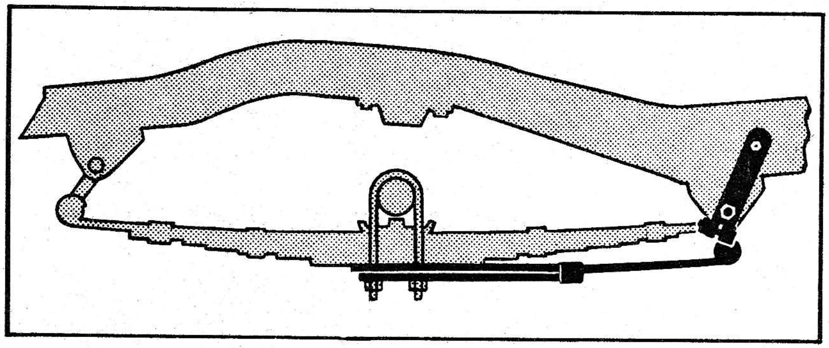
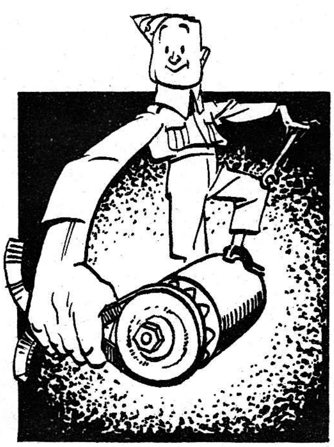


Fig. 3. All jeeps have this two-leaf Torque Reaction Spring tacked on the left front spring. Its job is to take some of the fighting roll out of the axle.

And all this for what?

To correct a little distemper that happens only when the jeep's forced to make a hard fast stop? To correct a quirk good drivers notice only once in a while? No. That wouldn't be sensible. Instead of the impractical costly modification to all ¼-ton 4 x 4's the Army's put the problem up to you fellows in the field. Mechanics—they're depending on you guys to give more attention to the Preventive Maintenance on jeep steering systems. Steering linkage that isn't adjusted properly can make the pull stronger, enough to smack your jeep hard to the left. Follow your vehicle manual and keep the steering in line and adjusted. Drivers—the Army's depending on you chums to know the pull's normal and nothing to get excited about. And, to learn the little trick of controlling it by relaxing your steering and pumping the brake during an emergency stop. The whole deal's in your hands. They're good hands . . . just use them.

x y z



Just signed up another member to the S.F.P.O.C.T.G.F.F.—Society For Prevention Of Cruelty To Generator Fan Fins. There are no dues, no initiation rites, no other obligations. You simply take one pledge—"I will not steady the pulley by using a screwdriver between the generator fan fins while loosening or tightening the pulley nut."

Instead you'll wrap an old drive belt around the pulley (the rubber belt gives a friction grip on the metal that'll hold tight, come what may), and apply all the manly strength you need to get the rustiest nut off.

Using brute force and a screwdriver will damage the fins on the generator fan and break them off. This'll not only upset the pulley balance so that the drive end ball bearings wear fast, it'll also cut down on ventilation so that the generator will overheat and wear out. You don't want that to happen, do you?

Then step right up and add your name to our roster.

Willys Carburetor

IT'S not a tough baby to overhaul—most of the job is straight routine. But that innocent little Carter that sits atop the Jeep's manifold has a couple of tricks up its throat that may throw you—particularly if you've been hanging around the G.M. Carter family.

As we mentioned in the July issue, it's a good idea to completely dismantle a carburetor before you start in to clean it.

There are a few exceptions to this rule however and you'll bump smack into one of them in the Willys' carburetor.

It's very seldom necessary to remove the main nozzle from this carburetor—the main nozzle being the one that delivers the fuel at high speeds and can be seen sticking up into the centre of the venturi if you look down through the air horn.

We advise (and the manufacturer backs us up) that this jet be left in its place unless it is damaged. You'll know why if you ever try getting it back into place again. This jet can usually be cleaned by just removing the plug and blowing it out.

If by fickle chance it is damaged and has to be replaced watch for these things. Make sure that only one gasket is installed between the nozzle and the seat in the casting. The nozzle's got to seat properly on the gasket too, because if it doesn't the fuel won't be at the correct level in the nozzle. If the fuel is too high it will cause flooding and a rich mixture. If too low it will serve up a lean mixture.

Then there's the lad who forgets the gasket altogether. This allows the tip of the nozzle to protrude too far into the venturi and again we have a damaging weak mixture.

Next on the list of things to watch out for on the Jeep carb is the float

You may have noticed on nearly every carburetor you've taken apart, that wear takes place on the lip of the float. It's usually just a little round spot on the float lip that touches the needle valve. The thing to do is not file half the float away with a mill file. Instead, use a narrow strip of fine emery cloth and just rub long enough to remove the worn spot—the important idea being not to change the shape of the lip.

Then of course there is always the so and so who will attempt to adjust the float level on this carburetor by holding the float down hard against the needle with his thumb. He ends up with an adjustment that provides all the evils of a low fuel level.

To properly adjust the float level turn the carburetor bowl cover upside down with **only** the weight of the float compressing the needle valve spring. (You know of course that the needle valve is spring loaded

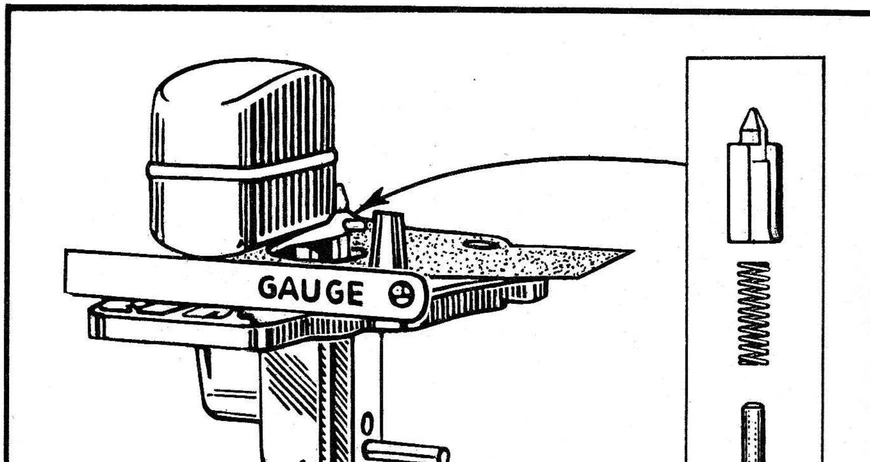


FIG. 1

on this job and that the length of that little spring is mighty important —don't monkey with it). With the bowl cover upside down (Fig. 1) the distance between the float and the machined surface of the bowl cover should be exactly ⅜"—don't try measuring this with the gasket in the way.

Talking about needles and seats, (not to be confused with the habits of a low form of practical joker) these come only in matched sets.

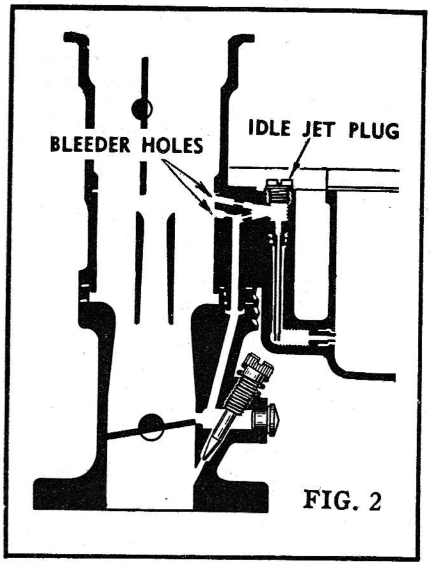


FIG. 2

Mix 'em up and you'll have more flooding troubles on your hands than a resident of the Mississippi Valley in springtime.

Although our trusty little jeep has only four cylinders, when each of them is firing properly—with just the right mixture—the result is sewing machine smoothness. However if just one of those cylinders isn't being fed properly the engine will bounce around like a jitterbug with the hives. Now one thing that can cause this poor idle is air leaks at the idle jet plug, (Fig. 2). This plug then must seat tightly on a good gasket to prevent them.

If on the other hand the engine rolls because of a rich mixture the reason may be improper cleaning.

There are two air bleed holes (Fig. 2) and these holes have a habit of collecting carbon. If they become partially plugged they ration the air supply accordingly—with rich mixture as a result. Sometimes these air bleeds can't be cleaned out by regular cleaning methods, so at the risk of being snubbed by the sergeant after all we've said about poking wires into carb jets—we say you may have to use a strand of **soft copper** wire to clean out these air bleeds. But be careful—because if these holes are enlarged the only fix is a new casting.

There's a couple of adjustments that are very often overlooked when overhauling this particular carburetor —one of them being the accelerating pump travel. You won't likely have the special gauge for making this adjustment but don't let that stop you from doing the job.

Here's how. Close the throttle so that the pump is at the top of its stroke, then scribe a line on the accelerating pump plunger rod flush with the bowl cover. Then move the throttle to its wide open position and scribe another line on the accelerating pump plunger rod flush with the bowl cover. It's no trick then to measure the pump stroke—it will be the distance between the two scribed lines and should measure exactly 17/64". If it doesn't, the length of the stroke can be changed to make it right by slightly bending the throttle connector rod. Bent it at the right place though—(A- Fig. 3).

Something to remember is that the accelerating pump adjustment must always be made **before** you adjust the metering rod (which we're coming to next.) The reason for this is that every change made in the length of the throttle connecting rod will alter the metering rod adjustment.

The metering rod is next to receive your attentive care—it being the second item that, more often than not, (more often when all new parts are installed) the adjustment is just assumed as being correct. This assumption usually leads to either a considerable waste of gasoline through a rich mixture or burnt valves and everything else that goes with a lean mixture.

The thing to do is always check this metering rod adjustment—whether new parts are installed or not—with the correct gauge (Carter No. T-109-26). To do the job, back out the throttle lever adjusting screw and close the throttle tight. Insert the gauge in place of the metering rod and loosen the nut on the metering rod linkage so that it can be moved slightly. Now the pin on the linkage can be moved so it rests in the notch of the gauge, then tighten adjusting nut. This gives you the correct adjustment when the gauge is removed and the metering rod is properly installed.

As we said at the start, this article

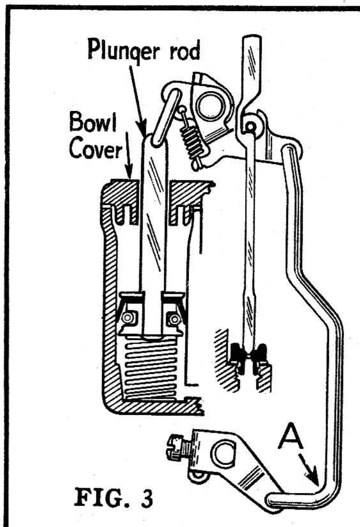


FIG. 3

covers the particular tricks worth knowing about the Jeep's Carter—maybe to some of you lads it's old stuff,—but from the somewhat better than nodding acquaintance we struck up with these carburetors in the field there's still a lot of blissful ignorance about these points. By all means be blissful but by no means be ignorant —not when it comes to overhauling the Jeep's carb anyway.

x y z

Cutting Capers with a Voltmeter

YOU may not believe this but so-help-us it's true. We heard that some so-and-sos locate trouble in starting systems this way. First put on the emergency brake, then they lock the transmission in gear. Next, of all things, they step on the starter. After about half a minute of this "frying" treatment they clamber under the vehicle and amid the smoke and smell of burned insulation, feel all the cables and connections. The hottest part of the circuit is usually the point of the bad connection. . . . We agree with you, anyone who would strain the battery and starting system like this is about two stages lower than a moron.

Finding poor connections in an electrical system can be fun (like H--- it can). Anyway it can be made easier if you know a smattering about voltage.

What's Voltage? It's the "oomph" in electricity—like horsepower is to a car. If there isn't any push behind the current—it just won't get there. If we have a happy battery (one that's fully charged) we would expect it to supply plenty of juice to crank the engine. If however, there's a poor connection between the battery and the starter, the voltage may be all pooped out before it reaches the starter. A resistance in ANY circuit is an obstacle to the flow of current—just like obstacles on an assault course are a resistance to you. The more obstacles there are the weaker you'll feel at the end of the course.

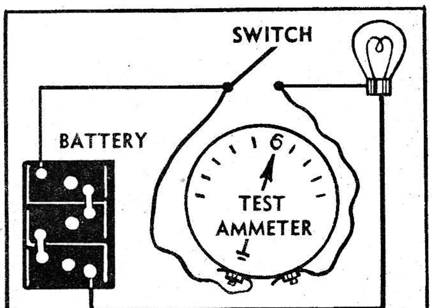


FIG. 1

The idea in an electrical system then is to get rid of all the obstacles, such as loose or dirty connections or undersize wires. By getting rid of all unnecessary resistance we'll have lots of energy left when the current reaches the starter or lights or what have you.

Because poor connections or resistance in an electrictal system can seldom be seen, locating the trouble without a voltmeter means going over each part of the circuit, inspecting, cleaning and tightening as you go along. But that's doing it the hard way—like removing the engine from a vehicle to locate a miss. Here's how high resistance (voltage loss) can be located in a jiffy with the help of a voltmeter.

When voltage forces current through a resistance, part of the voltage is lost—this lost voltage is called VOLTAGE DROP. If an electrical connection is good there will be no voltage drop. If the connection is poor and has resistance we can measure the amount of voltage loss with a voltmeter. The trick is to know how—but it's really simple, no kiddin'. The first point to remember is—when making VOLTAGE DROP tests the current must be flowing thru the connection or wire you are testing. This is only common sense tho' because, if no current is flowing—you'd get the same reading if you connected the meter to both terminals of the battery. This is illustrated in Fig. I. (We suggest you try this experiment for yourself).

A resistance is anything that will

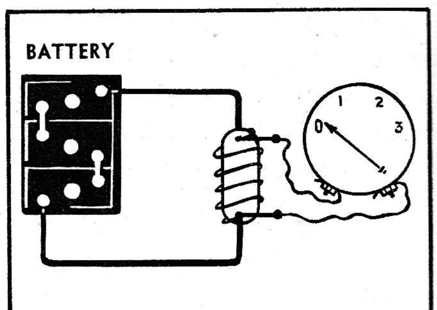


FIG. 2

decrease the flow of current. It might be a poor connection, an undersize wire or the filament of a lamp bulb. All of these things act in the same way—the voltage **drops** as the current passes through them.

Let's borrow the resistance unit off of an old voltage regulator and connect it to a battery as shown in Fig. 2. As the current passes through the resistance the voltage will drop. By connecting the test voltmeter as shown, we are able to measure the amount of voltage drop. In other words, if the resistance unit represented a bad connection, we would be measuring the voltage drop of the connection.

Simple ain't it?

Now let's connect three of these resistance units to a battery and a lamp bulb—as shown in Fig. 3.

If we make a voltage drop test of each seperate resistance unit and find the voltage drops one volt through each one—we would have a total voltage drop of three volts. We can prove this by connecting our test voltmeter across all three resistances at once (from A to B). If the voltage at the battery is six volts and we lose three volts through the resistances—we'll only have three volts left at the bulb. This will cause a shortage of current through the bulb, resulting in a dim bulb.

The same thing happens in all circuits where there's a resistance due to poor connections etc. in starting, lighting, ignition or generator circuits.

An illustration of testing the voltage drop in an ignition system is shown in Fig. 4. By testing in this manner it's possible to locate poor contact at the ammeter terminals or poor contact inside the ignition switch without removing any wires or taking the switch apart.

All wires have a little resistance therefore when making a voltage drop test, as in Fig. 4, there will always be a slight reading if the meter is sensitive enough. In this particular test on the ignition system there should never be a loss of more than two-tenths of a volt. If the voltmeter reads one volt or even one-half a volt you would know there was too much resistance in the circuit. Then you would have to test each part of the circuit to find the exact connection that is bad.

FIG. 3

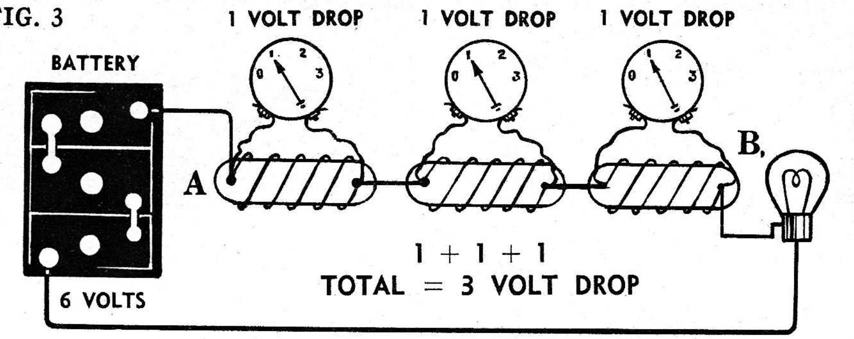
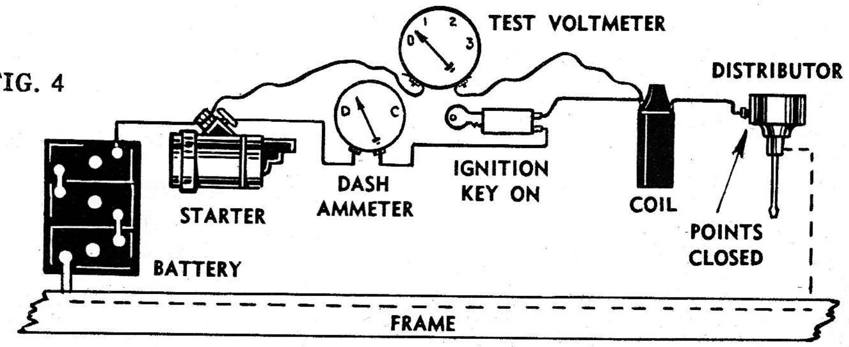


FIG. 4



As an example of "pinning down" the exact connection, lets take a gander at Fig. 4 again. We'll say for sake of argument we get a reading on the voltmeter of one-half a volt. Being the suspicious type—we test the ignition switch—(Fig. 5). Our voltmeter reads three tenths of a volt—hmmmmm. It should read zero. That means we must have a poor connection inside the switch. Well what do you know—without the trusty voltmeter we might have spent hours or days trying to find that bum switch.

Just remember when you're making tests with a voltmeter—the meter doesn't lie and that's where a lot of Joes go wrong. We saw one fellow testing from the ignition switch to the distributor one day and because he got over five volts drop on his meter he said the meter was crazy He forgot there was several hundred turns of fine wire in the primary winding of the ignition coil. A large voltage drop through the ignition coil was perfectly natural—due to the resistance of the winding.

We could go on for pages describing different tests but you would find the principle involved in each test exactly the same. To save you time we have made a chart (next page) which shows where to connect the test voltmeter to make most of the voltage drop checks on a vehicle.

So dust off your lil old voltmeter chum—and after a little practice—using the chart as a guide—you and your voltmeter will be pals for life.

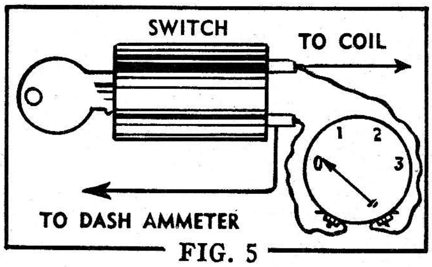
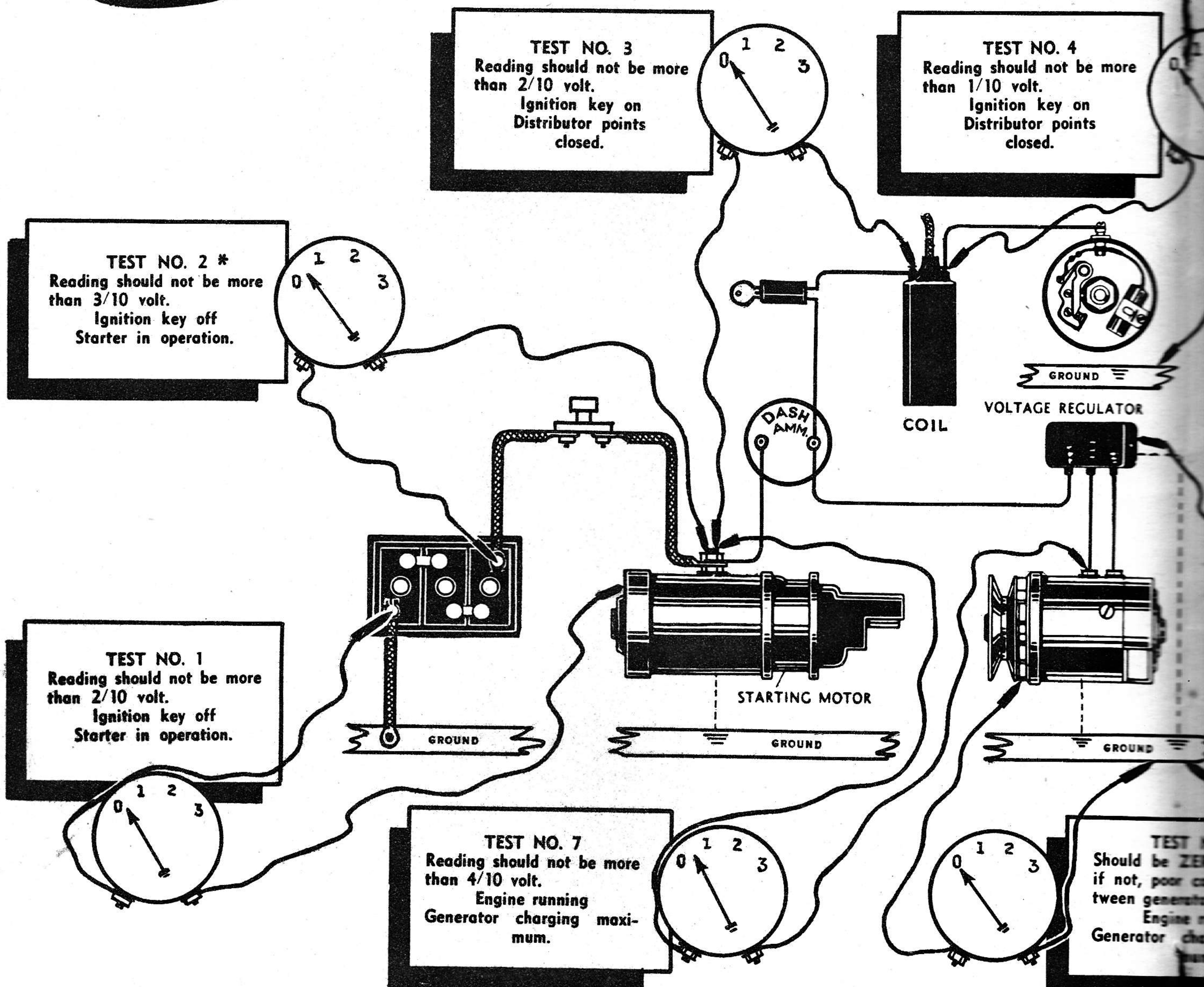


FIG. 5

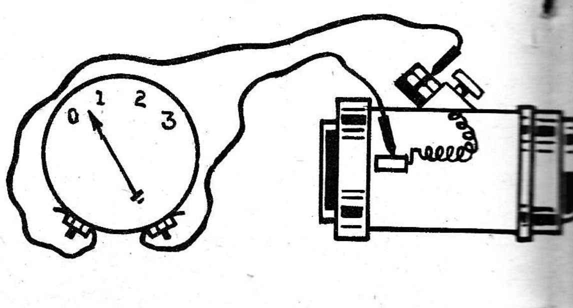
Voltage Drop Tests

There are seven tests shown on this chart. Each different test is illustrated by a test voltmeter. Make one test at a time, connecting your voltmeter as shown on the chart. REMEMBER—THE CURRENT MUST BE FLOWING IN THE CIRCUIT YOU ARE TESTING.

If a higher readin
chart is obtained—
the circuit separate
of the page.
The TOTAL volta
equal to the SUM O
EACH SEPARATE PA



* In some cases the starter switch is mounted on the starter motor housing. To test the starter switch in this case, connect one terminal of the test voltmeter to the exposed terminal of the starter switch and the other terminal of the meter to one of the insulated brushes in the starter. Voltage drop should not be more than ½ Volt.



ding than the one shown on the
—you'll have to test each part of
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OF THE VOLTAGE DROPS IN
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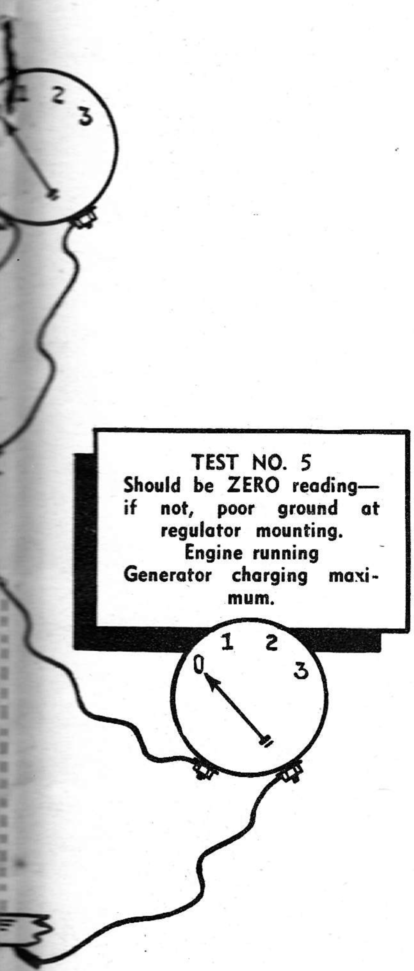
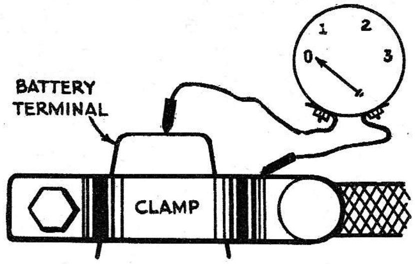


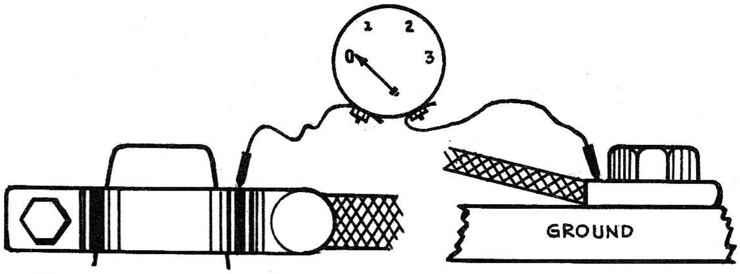
TEST NO. 5
Should be ZERO reading—if not, poor ground at regulator mounting. Engine running Generator charging maximum.

ST NO. 6
ZERO reading—
r connection be-
rator and engine.
ne running
charging maxi-
mum.

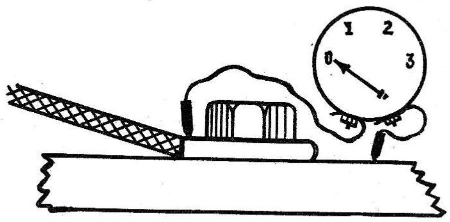
TEST NO. 1 – Make these tests with ignition key "OFF" and starter in operation.



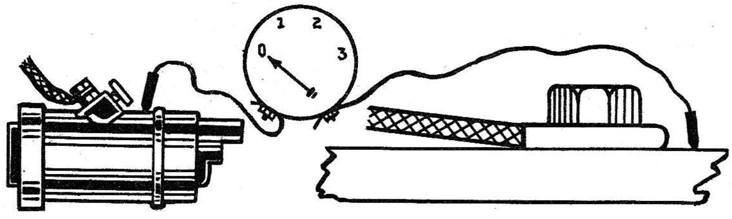
Should be "ZERO" reading—no voltage drop.



Should be less than 1/10 volt drop. (this will depend on the length of the cable).



Should be "ZERO" reading—no voltage drop.



Should be "ZERO" reading—no voltage drop.

There are lots more things you can learn about a voltmeter so if you liked this article and want a second helping—drop us a line. Write to "The Editor, Cam, Directorate of Mechanical Engineering, Department of National Defence Ottawa.

CONTRIBUTIONS

Do you know how to make maintenance easier? We're asking you.
Maybe you've got a better way of doing a job—perhaps a new trick for your trade.
If so, write CAM and let the rest of the boys in the field in on it.

Shadow Boards

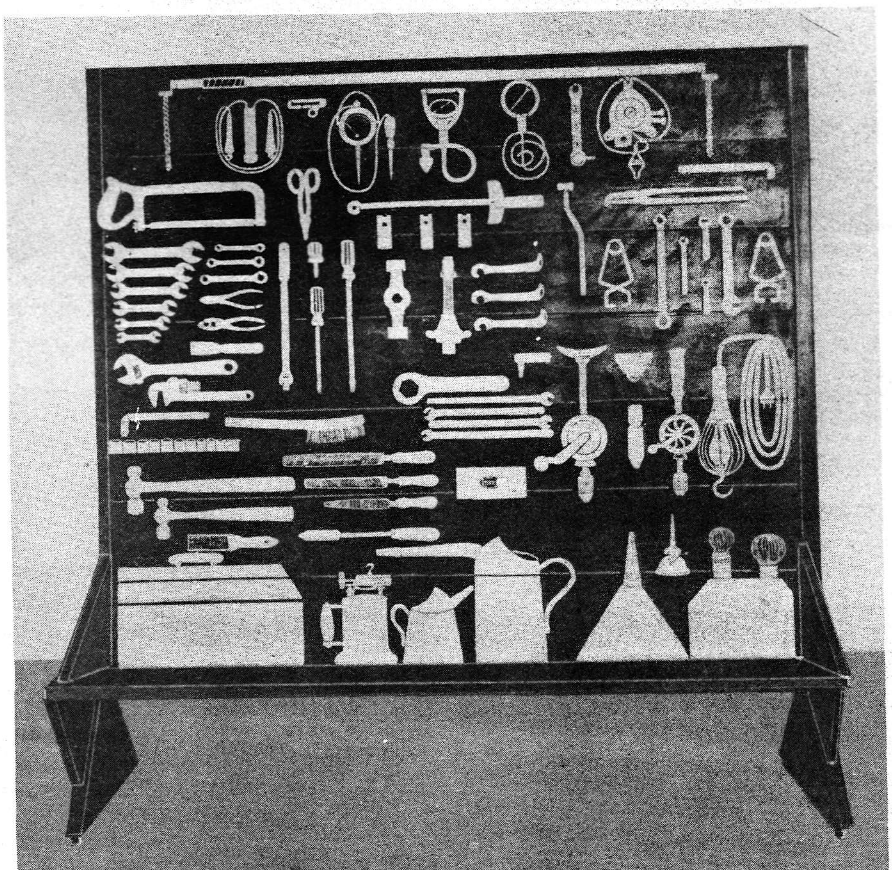
A place for everything and everything in it's place. That's the motto of some of the boys in unit garages that are really on their toes. We were so impressed by what we have seen and heard about the modern kitchen effect in a few of the shops we thought it only right that we pass the word on to one and all. With very little trouble you can make a shadow board that will enable you to spot tool shortages in less than no time and not only that, your tools will be right in front of you when you want them. There won't be any more of this two hour search for the timing light that isn't there because it was left on the fender of the last vehicle you worked on. When you finish a job—a mere glance will tell you if you have gathered up all your tools, and if you haven't you'll know exactly what is missing. We guarantee that this system of keeping a check on your tools will make you feel ten years younger.

We're not going to try and tell you exactly what type of shadow board you should make or what tools to hang on it. Those are details that you can figure out to meet your own particular set-up. What we can do is toss three samples in your lap and trust that they will give you ideas.

The first one is the portable type and as you will see in the illustration, it can be rolled right up to the job 'cause it's on casters. (If you haven't any casters, you'll probably find some on the "old man's" swivel chair). This type of board is the work of the D.E.M.E.'s boys in M.D.4, and we raise our shaving mug in salute to the idea. The construction is quite simple; however we suggest you make it at least six feet by five feet so there'll be plenty of room on it. One advantage of this board is that both sides of it can be used. Another advantage is the fact that it can be rolled into the office where it can be locked up at night.

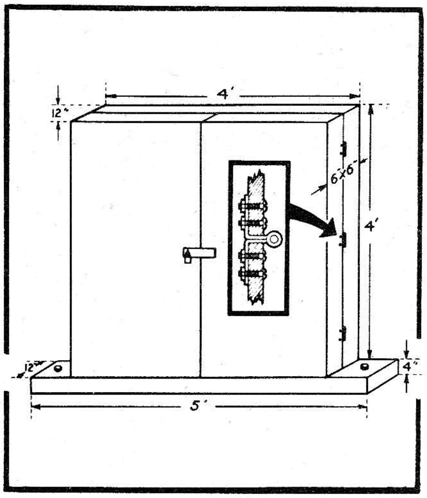
After the board has been assembled give it a couple of coats of black paint and when it has properly dried, the tools can be mounted in position. A bit of care should be taken in placing the tools on the board so that space won't be wasted, also you don't want the most frequently used tools way up at the top. After the tools have been placed in the most suitable position and held there by hooks or nails, you can trace the outline of each tool. Then remove the tools and paint their shape with white or yellow paint. Presto—a Shadow Board.

Another type of shadow board, let's call it "the open wall type", is



handy for tools that aren't frequently used or are too large to tote around the floor all the time. This shadow board can be just a plain flat board fixed to the wall in place say, of some of the shelves in the unit garage office. Being situated in the office the tools will be safe at night or when not being used, also the man in charge of the work sheets can be made responsible for their safe keeping during the day. A quick glance at the board will tell him what tools are out and a simple tag system will say who has them. For this idea we thank the unit garage of the Provost Corps in Sydney N.S.

The third type of shadow board will take a little longer to build than the other two types but it's really a honey—we call it the "Wall Cabinet" type. We have illustrated the wall cabinet showing the recommended sizes. When it's in the closed position it can be padlocked to keep mice and men out, but when it's opened



there is about 32 square feet of surface to hang tools on. The place to put the cabinet is where it is most convenient, perhaps on the wall behind the centre of your work-bench. As you will notice, the depth of the cabinet is twelve inches which allows lots of space to hang tools inside the doors. It's a good idea tho' to hang the lighter tools on the doors so there won't be too much strain on the hinges. We might add right here that you'll need offset hinges and they'll stand up better if they are bolted to the wood and the ends of the bolts riveted over.

As we said before, what tools you hang on your shadow board is entirely up to you—but we suggest that the more tools and equipment you are able to get on the board the better, because then you will be able to keep track of them without having to take inventory a dozen times a day.

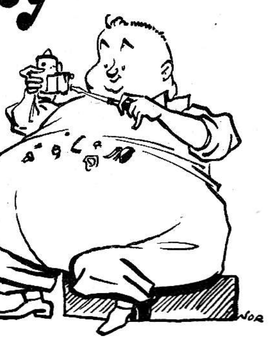
Don't forget the greasing equipment while you're at it—a shadow board will not only help keep track of the various guns and gimmicks but also keep them out of the dirt and scuff around the grease pit.

Get the idea? O.K. Slip a shadow board behind those tools while the idea's hot.

x y z

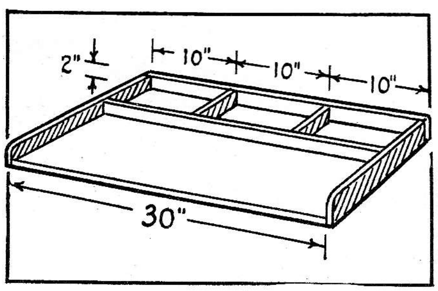
Carb Parts Tray

HAVE you ever lost a carburetor jet? You haven't? Well just send us your name and number or a reasonable facsimile and we'll send you Grandfathers collection of pin up girls—for having an honest face in spite of what you said.



Among our contributions this month we found this little idea (the work of a retiring and annoymous soul on the West Coast), and we think it will help you keep track of those elusive bits and pieces.

All you do is make up a tray, similar to the one we have illustrated. It really makes carburetor work a pleasure. Of course there's nothing to stop you from using it for fuel pump and windshield wiper overhauls as well.



The tray can be made out of any suitable material but probably the easiest material to use is a piece of 5-ply, 30" by 20", with 2" strips of 3-ply tacked around the three sides of the board. The three partitions can also be made from 3-ply strips 1½" wide.

To aid in the appearance of the board it should be painted or varnished. A light colour will make it easier to see small parts on it. If it's possible to obtain a sheet of celluloid, cut the celluloid to fit the various sections of the tray, this will make it a cinch to keep clean.

The three sections will be handy when doing carburetor work. Parts to be cleaned in Gunk can be placed in one section, parts that should'nt be soaked in strong cleaning fluid can be placed in the centre section, and worn or defective parts in the third section.

If after building this tray you still lose carburetor parts—we suggest you build a larger tray—one that you can sit in.

x y z

Maybe you didn't know we had a Yogi on our staff but Sgt. O'Sweat's got so much on that old crystal ball he's able to read our mail before we open the letters. If you have any maintenance headaches don't reach for an aspirin—don't bother the Padre—just bring your troubles to O'Sweat. Somewhere there's an answer to your problem and the Sarge knows where.

Address your questions to Sgt. O'Sweat, Cam, Directorate of Mechanical Engineering, Department of National Defence, Ottawa.

Dear Sarge O'Sweat;

I have heard of a method of testing condensers without using any special testing equipment. Here is how the test can be made.

Run an engine of another vehicle at idling speed and while it is running, touch the lead wire of the condenser about to be tested to one of the spark plug high tension terminals, At the same time, touch the case of the condenser to the cylinder block. The idea is to see if you can charge the condenser with the high tension spark. After a few seconds remove the condenser and discharge it by touching the end of the pig-tail to the condenser case. If there is a good healthy discharge, the condenser is good, if there is no discharge, the condenser is bad.

Would you say this is a satisfactory test for condensers or not—thank you.

Yours truly,
Cpl. M. N. S.

Dear Corporal M.N.S.

It's a long time since I have heard of anyone using this means of testing a condenser. To my mind it would be like testing a compressor tank at 10,000 pounds pressure when the tank was only designed to withstand a pressure 200 pounds.

You see condensers normally operate at about 350 volts. The average condenser tester tests them at from 350 to 500 volts, The voltage in the **high tension circuit** of the average vehicle runs between 10,000 volts and 15,000 volts which is high enough to puncture the insulation in even a good condenser—therefore I would say it isn't a very good test.

If no testing equipment is at hand it's a simple matter to test a condener by trying it out on another vehicle that you know is operating O.K. This is a tried and proved method and is the next best thing to having a proper condenser tester.

O'Sweat

Dear O'Sweat:

Some of the boys in our shop have become real slickers when it comes to using the Vacuum Gauge. We like to use it on every job, but alas and alack—we are stumped when it comes to some Jeeps.

Why in the name of Christopher Columbus don't all of the Jeeps have a hole in the manifold where we can connect the vacuum gauge.

Sgt. R. O'L.

Dear Sergeant O'L:

Don't get your dander up sweetheart—where there's a will there's a way. You see, older model Jeeps didn't need a hole in the manifold because they were equipped with electric windshield wipers. Why they didn't poke a hole in the manifold anyway is a mystery. There's nothing to stop you from making a hole in it yourself tho'.

Drill a hole in the intake manifold using a 11/32" drill. Take every precaution to prevent the cuttings from getting inside the manifold. Heavy grease on the drill will help by causing the cuttings to stick to the grease. Next, thread the hole for a 1/8" pipe plug, which you can draw from spare parts. Then you'll have a connection for your vacuum gauge whenever you want it.

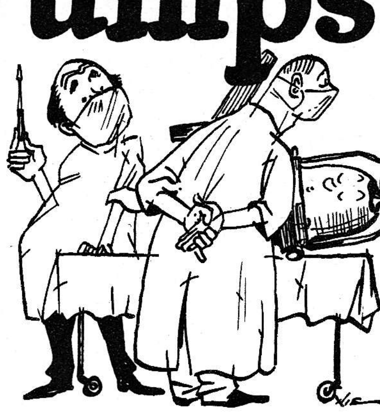
You probably know this already but I'll remind you anyway. The Willys motor—having only four cylinders, will cause a very rough reading of the vacuum gauge at slow speeds. In order to stop the needle from bouncing all over the dial you'll probably have to put a restriction in the rubber hose between the gauge and the manifold when working on 4 cylinder engines. The easiest way to do this is tie a **loose** knot in the rubber hose—the tighter the knot—the less will be the fluctuations. Don't make the knot too tight cause if you do the vacuum gauge reading won't be sensitive enough to locate troubles.

O'Sweat

(Continued on next page)

NUMBER TWO OF A BRACE OF ARTICLES ON

Fuel Pumps



Last month you remember, we did a cleaning job on the pump without removing it from the vehicle

ABOUT 99 44/100 per-cent of the time, the cleaning operation would be all that the pump needed, but for the sake of argument and this article—let's say the pump still won't deliver.

In which case, we reach for the tools and take the pump off, because we've got to put it on the dissecting table and examine it's gizzard.

After we get the pump on the bench we first mark the edges of the cover and body with a file so we'll be able to get it back to-gether in the right place. Then strip everything and clean it just like you would a carburetor or your teeth. (Tho', we don't recommend Varsol or Gunk Cleaner on your dentures as it doesn't contain Irium). Some care should be taken when dismantling the pump especially an A.C. when they are equipped with oil seals. If you tilt the diaphragm to unhook it from the link you'll damage the seals for sure. The best way to disassemble all A.C. pumps that have riveted diaphragms is to remove the rocker arm, pin and link first, then the diaphragm will come out easy like, without damaging the oil seals.

There are nearly as many types of fuel pumps as there are types of Cooks in the army so we won't try to tell you how to assemble each different type. There are a few general rules tho' that apply to all fuel pumps and one of them is what parts should be replaced when.

Now if you were lighting your pipe—you wouldn't try to use the same match twice. When it comes to assembling fuel pumps you just don't use some parts over again. These parts are the gaskets, the diaphragm, the valves and valve springs, so renew 'em every time. The rest of the parts should be inspected and here's what to look for if you want to know **how** much is **too** much wear.

There are three places on the body that should be checked for warpage, these places are the mounting flange, the diaphragm surface and the filter bowl gasket seat. The flat surfaces can be checked with a straight edge but the best way to check the bowl gasket seat is to place the filter bowl against the cover without the cork gasket and see if it rocks. If it's not warped it won't rock. The mounting flange and the diaphragm surface can easily be trued with a fine file but truing a warped filter cover is rather difficult, although it can be done on a lathe. If the warpage is only slight two cork gaskets between the bowl and the cover may do the trick but if it is badly warped it's best to install a new cover. Another point to be checked on the body is wear at the rocker arm pin holes. If a new pin is loose in the hole—don't argue—replace the pump body.

The linkage can be a bit of a bother too so check the various pin holes for wear—if the pins are a sloppy fit—replace the linkage, this also applies to the diaphragm pull rod and rocker arm. All rocker arms get shiny on the cam-shaft end after they have been in service, however this shiny spot doesn't matter. If there is definite wear tho' or it is scored—the rocker arm should be replaced. Don't try to repair the old rocker arm by heating and bending it or by building up the cam-shaft end of it. Sure—we know it has been done but very often it will still give

(Continued on page 198)

O'SWEAT

Dear Sir:

Will you kindly furnish me with information regarding big end jobs of connecting rods in motorcycles.

Would you advise it necessary to fit the big end of connecting rods with oversize bearings when you detect the least bit of up and down play?

How much side shake at the top of male rod would you allow before considering a lower end job necessary? Is 1/4" too much?

Pte. S.S.

Dear Pte. S.S.

If by the "least bit of up and down play" you mean an "appreciable amount" there is good grounds for a assuming loose big end bearings.

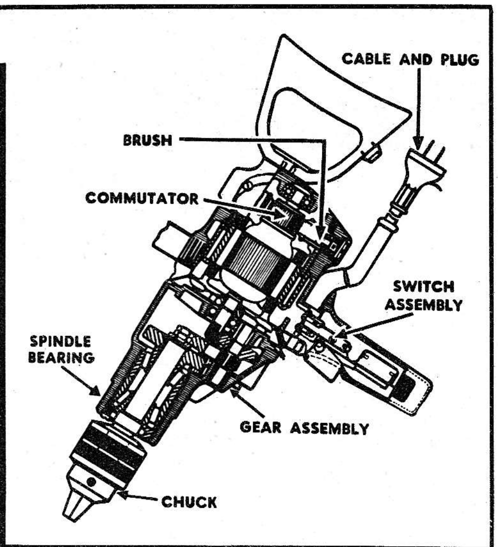
The easiest way to get the story on the lower bearing's wear tho', is by the amount of side shake at the top of the rod.

According to the Operation and Maintenance Manual (MC HD1) any side shake of 1/8" or more at the extreme upper ends of either or both rods indicates lower bearing wear. If you have 1/4" of shake—I'd say the big end should be rebuilt with oversize rollers.

Pages 23 and 30 of the Maintenance Manual tell the complete story on this job.

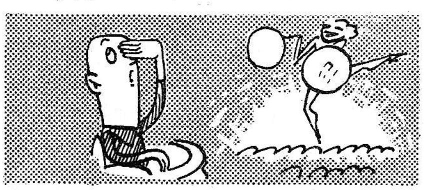
O'Sweat

Pertinent Points on Portable Electric Drills



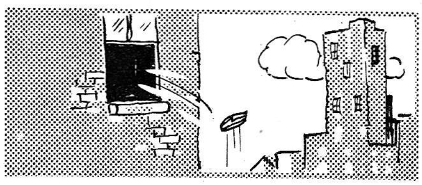
DID you ever stop to think just how tired you'd be if you had to use a hand drill all the time? To say the least life would be awfully "boring" if your faithful electric drill lay down and died. Even tho' it's small and compact, it carries a lot of power and saves a pile of man hours for the more important things in life. Don't take our word for it tho'—go ahead and mistreat it—overload it—don't oil it or clean it—but some day you'll be using your bridgework to bite holes in boiler plate.

On the other hand the electric drill is by nature a reliable little piece of equipment. All it asks is proper use and maintenance to keep it happy in the service.



SHOCKING

Like Nazi pilots every electric drill should be grounded so you won't be under the impression you've been given a hot foot if the drill develops an internal ground. This is particularly important where the drill is being used in damp surroundings or where abrasive dust is apt to create a ground. In cases where a 3 prong plug is used the tool will be automatically grounded provinding of course the outlet is properly grounded. If the drill is equipped with a 2 prong plug there are usually 3 wires inside the cord, one of the wires being attached to the body of the drill at one end and the other end of the same wire must be grounded to the outlet. **Make sure** the plug end is properly grounded to the outlet—unless you like shocks.

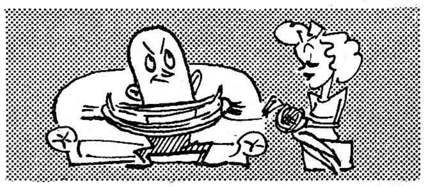


OOPS—WRONG OUTLET

Most electric drills used by the Army are designed to operate on 110 Volts 60 Cycle AC or 110 Volts D.C. However, a quick glance at the name plate on your drill will tell you what voltage it is designed to operate on. If you plug your drill into a 220 Volt outlet when it's been designed to operate on 110 Volts—well—all you'll need is a blanket and you can make smoke signals. Although the drill will work satisfactorily at ten percent over or under the specified voltage, serious damage to the motor and loss of power will result if the voltage varies more than ten percent from the name plate specifications.

If the drill runs slowly, lacks umph, gets hot or smokes, disconnect it immediately. Check the supply line with a voltmeter to make sure the voltage has not changed more than ten percent. If the voltage is O.K. and the drill still shows signs of trouble—check it thoroughly for possible defects.

When you haven't got a voltmeter and aren't sure of the voltage, one way **not** to check it is to plug in the cord and close the switch. Instead, try a 110 Volt lamp bulb in the socket because it's cheaper to burn out a bulb than to burn out the drill. If the bulb lights with normal brilliance, it's safe to try the drill. If the bulb burns out or glows brighter than Uncle Dudley's nose, you've probably tied into a 220 or 440 Volt line—a bit too hot for a pint-size drill. Never forget that a voltmeter provides the best means of checking voltage.



WIND IT UP

The electric cable is the "life line" of the electric drill. If you use the cable like a tow rope to drag the drill around the shop, or hang the drill up by it, the Sarge will very likely use the cable around your neck to blow a fuse. Keep it away from oils and greases which will damage the rubber insulation. Wipe the cable clean frequently but not with gasoline or oil. Use soap and water, being careful not to get water into the drill or the switch. Never tie knots in the cable as this will strain—if not break the wire. Always wind the cable in loose coils when it's not in use—don't wrap it tightly around the drill.

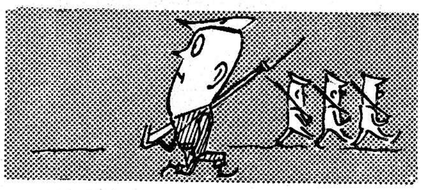
If an extension cable is necessary to reach a power outlet, be sure the extension is made of wire large enough to carry current to the drill without too great a drop in voltage. If there's much loss of voltage, the drill will lack power and won't operate properly.

CHUCK CLUCKS

Drill chucks are one reason why mechanics go bald—their hair doesn't fall out—they tear it out. The chuck of the drill is really a precision part and if not abused will last a long time. How often have you stood before a mirror and seen some queer looking individual placing a drill in a drill chuck and **not "bottoming"** the shank of the drill in the chuck—mmmm?

Anyway, this is swell way to make the chuck jaws run out of true. The shank of the drill should **always** bottom in the chuck as this permits the jaws to grip the shank fully and prevents cocking of the jaws.

There's another point where we all slip up once in awhile. All three holes in the chuck body should be used to tighten the chuck. Insert the key in each hole in rotation and tighten as much as possible. This insures a uniform grip on the drill shank, preventing unequal strain on the jaws and slippage of the drill. (Only one hole need be used to release the drill.) The chuck jaws should **only** be tightened with a key. Pliers, screwdrivers, hammers, wrenches etc. are strictly out of style and will damage the chuck mechanism. Drills equipped with Morse taper socket spindles use drill bits with corresponding Morse taper shanks. Be sure the tang fits in the socket correctly and tap the end of the drill **lightly** with a rawhide or composition hammer. (A piece of 2 x 4, if a hammer isn't available.) Don't ruin the point of the drill tho' because you may want to drill a hole with it. To remove a taper shank drill, always use a drift key. The chuck key should always be tied to the handle of the drill, preferrably with a leather strap—then—like we heard the Victory Bond Salesman say—"You'll always have it when you want it.

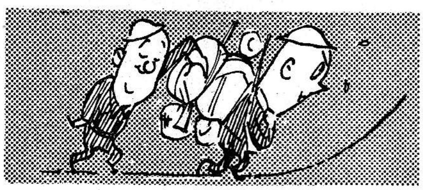


TWISTS ON DRILLS

Electric drills are most frequently used with twist drill bits for drilling holes in metal. The electric drill supplies the turning power but the operator must supply the forward pressure to feed the bit into the work. In general, high speed and light feed are recommended.

When used in three-jaw chucks, twist drills should have straight shanks. (The story of correct sharpening of twist drills was unfolded in the December issue of CAM—Volume I, Number 3, page 35—Ed)

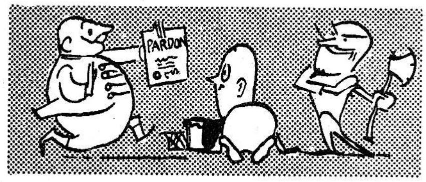
The drill bit should be lubricated with oil for all types of metals—except cast iron.



FULL PACK PLUS

You don't like to be overloaded—neither does the electric drill. A drill will ordinarily absorb accidental or emergency loads—they're made that way, but constant overloading will cause serious damage. A quarter inch electric drill is designed and powered to drill one quarter inch holes—no larger. Turning down the shank of a half inch or three-eights drill bit so it can be used in a quarter inch electric drill is like you being loaded with two full packs and two rifles on a 30 mile route march. Gad—don't be a cad—don't turn down drill shanks.

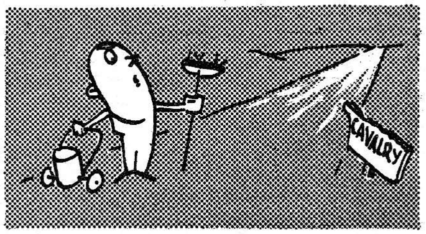
If the drill stalls, it's usually because it is overloaded or improperly used. When this happens, turn off the switch, remove the drill from the work and determine the cause of stalling. Don't click the switch on and off in an effort to start a stalled drill. This practice will damage the switch, overheat the motor and frequently break the bit. To avoid stalling, relieve the feed pressure as the bit pops throught the finished hole.



COMMUTATOR COMMUNIQUE

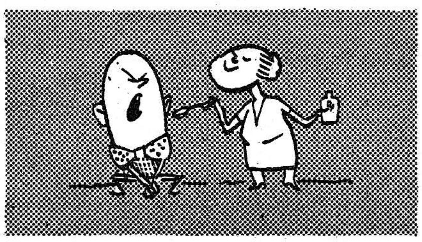
Yes, the commutator, being the nerve centre of the electric drill requires regular attention. It should be kept clean, free from dirt and grit and smooth as the guys' face in the shaving cream ads. If it's rough, smooth it off with very fine sand paper—don't use emery cloth. If a groove has been worn by the brushes, the commutator will have to be turned down on a lathe. If the mica insulation between the commutator bars was originally undercut, it must be undercut again after the turning operation. Check the soldered connections at the commutator bars. If the solder has become loose, resolder before the leads break loose. If there is excessive arcing at the commutator check for the following:

(1) weak brush springs or brushes not contacting properly;
(2) commutator bars may be worn to a point were mica is above the bars, causing brushes to jump;
(3) wrong brushes;
(4) wear of armature shaft bearing.



BRUSHES WITHOUT BRISTLES

Almost 75 percent of portable electric drill trouble can be traced to lack of attention to the carbon brushes. Check 'em frequently. Keep them free from dirt and dust and see that they always move freely in their holders. There should be enough spring tension to keep the brushes in firm contact with the commutator. Replace badly worn brushes immediately with the proper type.



GIVE IT ERL

Being "well oiled" may be a bad habit—it depends on the oil. The electric drill works **best** when it's oiled. Just pause for a minute and try to remember when you oiled your drill last—now go and oil it. Under normal conditions a drill should be lubricated once a month. It only takes a few drops of oil in the right places—so learn where the oil holes are and don't neglect 'em. Some drills are equipped with factory packed bearings and in this case the bearings need no further lubrication at anytime. If your drill has oil holes—it needs oil.

As a parting thought 'spose we just say that the best way to be drill happy is to look after your drill—check it over **often** so that the first indication of trouble isn't when the drill goes dead.

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FUEL PUMPS

(Continued from page 195)

trouble and anyway you'll waste more time than the rocker arm is worth. The diaphragm spring tension is very important because it controls the pressure of the pump. If springs look collapsed or stretched or if they are corroded replace them.

On some pumps the valve and valve seats come in an assembly—in this case you'd replace the seats every time you replaced the valves. On pumps that have separate valves and seats it is important to check the seats. If they are worn irregular or are rough or loose they are bound to result in leaky valves. If you can get new valve seats and have the tools to put 'em in, all well and good, otherwise you'll have to replace the whole body with new valve seats in it.

Some valves are packed in heavy grease or wax when they come from spare parts. If the valves are installed in the pump this way it's just like trying to drink a quick one without taking the cap off the bottle. If you come across any of these valves that are all stuck up make sure you wash them in clean varsol before you install 'em in the pump. Another thing, if you want the cloth diaphragm to last a long time—soak it far for a short time in Kerosene or Coal-oil, this will soften the diaphragm making it more flexible.

In some parts kits diaphragm gaskets are supplied. When installing these the gasket should be below the diaphragm. The proper flexing of the diaphragm is very important in fuel pump operation so when you're installing the top cover or upper body to the lower body, the rocker should be held so that the diaphragm is level with the casting. Then place the cover in the correct position, lining it up with the file marks you made before you disassembled the pump. The diaphragm screws should be tightened to the point where they barely engage the lockwashers, then actuate the diaphragm with one or two strokes of the rocker arm, then release it allowing the diaphragm spring to push the diaphragm up. Now you can tighten all the screws evenly and alternately—just like you would cylinder head bolts.

The rocker arm pin must be riveted in position otherwise the pin might work out when the vehicle is in operation—and that's bad.

Remember what we said about tightening the filter bowl—don't over tighten it but make sure there are no air leaks.

If everything has been done properly the pump should operate 100 per cent, but no matter how carefully the job has been done it's always a good idea to test the pump on the bench before installing it on the vehicle.

The bench test is practically the same as the test on the vehicle except you have to pump the rocker arm by hand. Of course the pump should be tested "wet" and as it's not a good idea to have gasoline around the bench you can use clean kerosene or coal-oil. Attach a tube on the inlet side of the pump, putting the other end of the tube in the can of coal-oil. Attach a fuel pump pressure gauge to the outlet side of the pump—and operate the rocker arm. Normal pressure will vary between 2 and 4 pounds. Next change the connections around and take a vacuum reading from the inlet side of the pump. Normal vacuum is between 8 and 12 inches. If the pump tests O.K. it's ready to be put back on the vehicle.

When you install the pump, make the job easy by cranking the engine over with the starter to a point where the cam-shaft won't push on the rocker arm while you're installing it.

Now, with the knowledge of a good job well done you can figure on that fuel pump delivering the goods as, when and where required.

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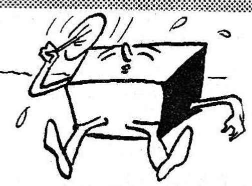
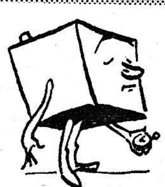
Current* Affairs Test

***And we do mean BATTERY current, The question is: Do you know all the Answers?**

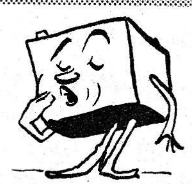
1. When should a battery be removed from a vehicle for recharging?



2. At what rate should a battery be charged?



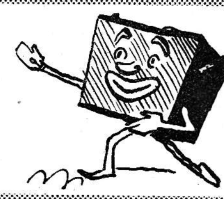
3. After a battery is placed on charge, how soon should the first inspection be made?



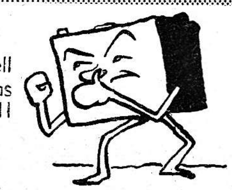
4. Why does a battery generate gas while charging?

5. What causes a sudden rise in specific gravity reading toward the end of the charging period?

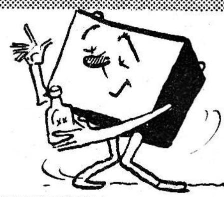
6. Why does the electrolyte sometimes turn a dark chocolate color during charging?



7. How can you tell when a battery has reached its full charge?



8. Should anything but distilled water be added to a battery?



9. Must the electrolyte specific gravity be adjusted as a battery grows older?

10. How low must the temperature go to freeze a fully-charged battery?

If you need a jolt with a volt before you can answer these questions — turn the page and short-circuit your sarge.

Right Answers

to Battery Servicing Questions on the preceding page

1. When its hydrometer reading has dropped to 1225 or lower. At that reading, a battery is just about half-charged. So you'd better pull out the battery and put it on charge. Also, if separate cell readings vary more than 20 or 30 points, your battery may be going bersek — so that's another cue to remove it from the vehicle for inspection and test. Remember this, too—no battery should be left sitting around in a pooped-out condition. Sulphation—always produced during discharge—can damage the plates if it isn't promptly reduced or removed by recharging.

2. Any rate is okay—provided it doesn't heat up the electrolyte above 110°F. Too much heat, cooked up by charging, has a very unhealthy effect on plates and separators. One way to prevent overheating—and over-charging—is to reduce the charging rate as the battery approaches full charge.

3. This depends on the type of charger you're using. When you are charging the battery at a low rate, take a gander in about three hours to make sure its not over-heating—or gassing so hard that the electrolyte is bubbling over. If charging at a higher rate the temperature may rise quickly. The point to remember is—don't let the temperature rise above 110°F. If that's happening, or if the inter-cell connectors feel hot to your hand, either slow down the rate of charge or take the battery off charge for awhile to give it a chance to cool off.

4. The bubbling gases are hydrogen (at the negative plate) and oxygen at the positive). They're released when the charging current breaks down the electrolyte water (H_2O) into its component parts. Just plain chemistry, that's all. And it's just plain self-preservation to keep lighted cigarettes away from batteries on charge. These gases have been known to explode.

5. In the early stages of battery-charging, the charging current usually produces concentrated sulphuric acid which settles to the bottom of the cell—because it's heavier than the rest of the electrolyte As the battery nears full charge, the gassing action stirs up this acid and mixes the electrolyte thoroughly. Result: a rapid rise in specific gravity—and your first true hydrometer reading.

6. You're more likely to notice this dark chocolate color in old batteries that are on their last legs. It's caused by stirred-up sediment or active material that's been loosened from the positive plates. In any case, don't pass your cup—it isn't cocoa.

7. This is too easy. Your battery is fully-charged when it's gassing freely and when three separate hydrometer readings— taken one hour apart—show no further rise in specific gravity (it should be between 1270 and 1285).

8. Not if you can help it. But if there's not a drop of distilled water in sight, use any clear drinking water rather than let your battery run dry.

9. Practically never. A battery's full-charge s.g. decreases very little with age. It's not likely to require any adjusting at all—unless you've lost some electrolyte through spilling or leaking, or something new (in the form of acid) has been added. (If you must add acid solution, be sure the s.g. is no higher than 1400—or it will injure the plates and separators.)

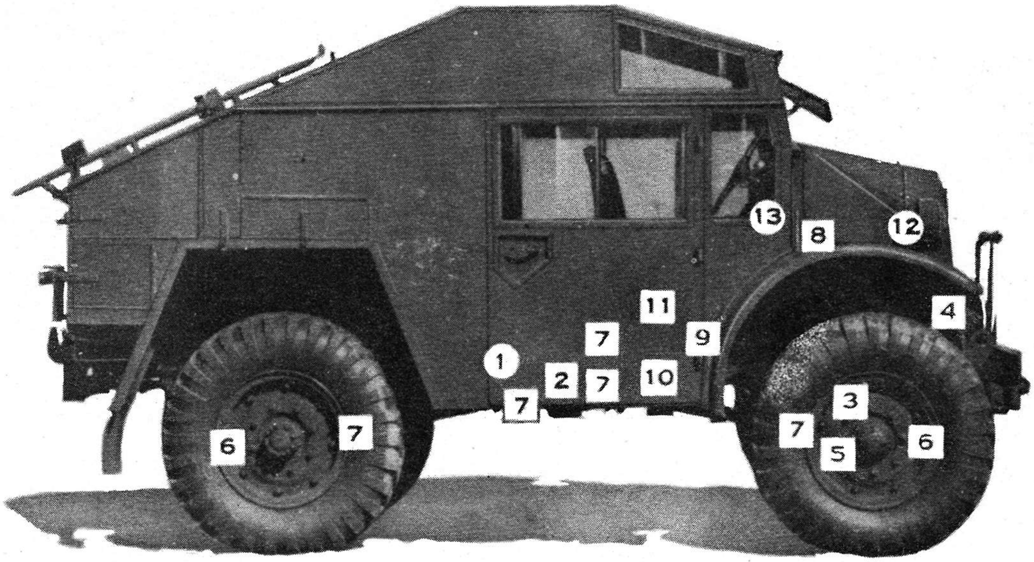
10. All the way down to 85° below zero F—or well below the freezing point of brass monkeys. A fully discharged battery, on the other hand, will freeze at around 32° above zero—since its electrolyte is mostly water. In cold weather, the gravity of your situation depends—inversely—on the gravity of your electrolyte.

NOTE: The above answers apply to storage batteries whose full-charge specific gravity is between 1270 and 1285, at a normal electrolyte temperature of 80°F. In other words, healthy batteries in temperate climes. In the tropics, the s.g. should be considerably lower—about 1200 (at 80°F.) when fully charged.

Any other questions on battery servicing? Shoot 'em in to Sgt. O'Sweat for his positive or negative replies.

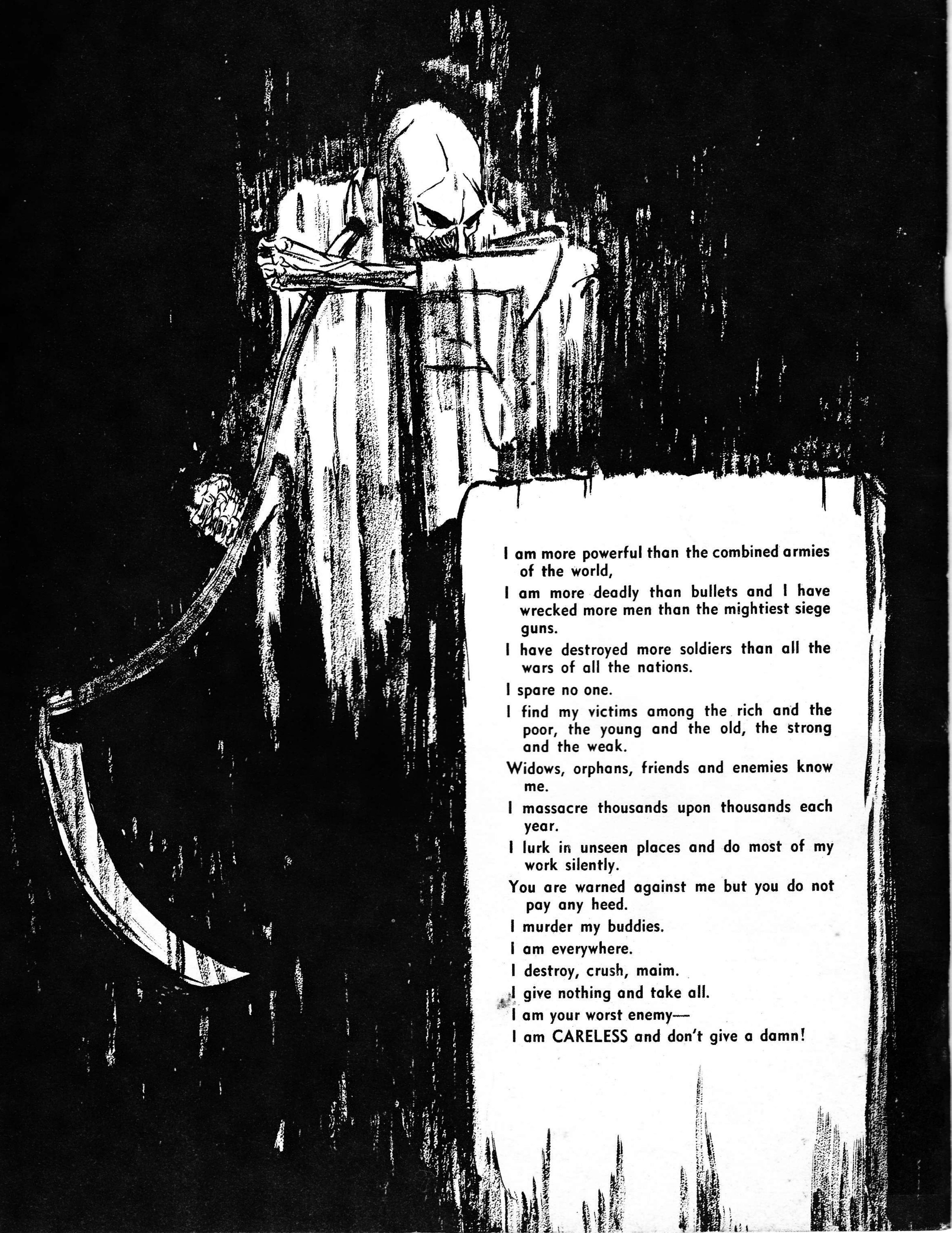
How's your Ford--FAT?

Is your FIELD ARTILLERY TRACTOR up to date? It is—well then you can check over this list of modifications with a clear conscience. If there's a doubt— here's your chance to find out. Just run your mind's eye over the following and then check the various points on your vehicle.



1. Drive Shaft Brake Adjusting Bolt
   Modification Bulletin D-1
   Nuts—there should be two on the adjusting bolt.
2. Booster Brake Changeover Kits.
   Modification Bulletin D-3
   Reinforced type air hose connections are the style on these babys now instead of all rubber.
3. Steering End to Front Axle Flange Bolts & Nuts
   Modification Bulletin E-1
   Castle nuts are S.O.S.—they should be replaced with longer bolts and heavy plain nuts.
4. Sturdier Steering Gear Assembly
   Modification Bulletin F-1
   New type has 4 mounting holes in the base and has a 1" longer steering column
   Modification Bulletin F-3
   The steering "Stops" on the flange should be built up by arc welding to increase joint life.
6. Axle Housing Relief Valve.
   Modification Bulletin G-2
   The right way is to have a one way instead of a two way valve.
7. Drive Pinion Dirt Deflector
   Modification Bulletin G-3
   Deflector is spot welded to drive pinion flange for protection of oil seals in dusty or sandy places.
8. Engine Serial Number Location.
   Modification Bulletin I-3
   You should be able to identify Ford engines when they are removed from the vehicle.
9. Transmission Gear Shifter Fork-Reverse.
   Modification Bulletin J-2
   If shifting into reverse is difficult—this may be the answer.
10. Transmission Countershaft Gear Thrust Washers
    Modification Bulletin J-3
    Prevents excessive wear on countershaft thrust bosses.
11. Transfer Case Control Shift Lever Lockout Plate.
    Modification Bulletin K-1
    If it isn't on your vehicle maybe it should be—check bulletin for part numbei before indenting.
12. Radiator and Core Metal Breakage
    Modification Bulletin L-1
    Mounting bolts should not be too tight and in some cases the lugs on each side of the core should be bent parallel to radiator.
13. Generator Regulator Mounting
    Modification Bulletin M--2
    Regulator should be moved to a new position for better operation—you don't have to alter the wiring.

○ *OF SPECIAL INTEREST TO UNIT GARAGES.*


I am more powerful than the combined armies of the world,
I am more deadly than bullets and I have wrecked more men than the mightiest siege guns.
I have destroyed more soldiers than all the wars of all the nations.
I spare no one.
I find my victims among the rich and the poor, the young and the old, the strong and the weak.
Widows, orphans, friends and enemies know me.
I massacre thousands upon thousands each year.
I lurk in unseen places and do most of my work silently.
You are warned against me but you do not pay any heed.
I murder my buddies.
I am everywhere.
I destroy, crush, maim.
I give nothing and take all.
I am your worst enemy—
I am CARELESS and don't give a damn!